

Endocrinal & Ultrasonographic Parameter in the Diagnosis of Polycystic Ovarian Syndrome

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Abstract: PCOS is characterized by an amalgamation of symptoms & causes multiple abnormal cysts in enlarged ovaries, so they do not ovulate normally. **Aim:** To study the value of hormonal and USG parameters in the diagnosis of pcos. **Settings & Design:** This's a prospective observational study. **Materials & Method:** Fifty women with PCOS diagnosed on the basis of clinical, hormonal and ultrasound parameters using the Rotterdam criteria . women without PCOS , having regular cycles which were selected randomly comprised the control group (n = 50) taken all from the patient attending OPD. Serum levels of LH, FSH,TSH PROLACTN, testosterone and USG done in each patient. **Statistical Analysis Used:** All the data were analysed by statistical software spss16. **Result:** The mean serum LH & FSH in PCOS cases is $8.43 \pm 2.78 \text{ mIU/ml}$ & $3.91 \pm 1.278 \text{ mIU/ml}$ respectively. The ratio of LH/FSH is 2.18 in PCOS cases compared to only 0.9 in control. The mean serum TSH, PROLACTIN & testosterone in PCOS cases is $3.03 \pm 2.54 \mu\text{IU/ml}$, $21.37 \pm 26.07 \text{ ng/ml}$ & $0.87 \pm 0.426 \text{ ng/dl}$ respectively. PCOS cases have enlarged ovaries measuring more than 10 ml. 60% (n=30) of the PCOS group have more than 12 cyst of significant size. **Conclusion:** The study justifies the elaborate evaluation of endocrinal & USG parameters can make a great contibution in diagnosis of PCOS patients.

Keywords: pcos, rotterdam criteria, USG, LH, FSH, TSH, PROLACTIN

1. Introduction

Polycystic ovary syndrome is the most common female endocrine disorder affecting 5 - 10% of women of reproductive age (12 - 45 years) and is thought to be one of the leading causes of female infertility. (Boomsma et al, 2008)¹ Rotterdam consensus workshop indicated PCOS is diagnosed for presence any of two of the following criteria: (Azziz R et al, 2006)³ Polycystic ovaries are presented by the ultrasound.

1. High levels of male hormones (Androgen).
2. Menstrual dysfunction.
3. The disorder causes multiple abnormal cysts in enlarged ovaries, so they would not produce the normal number of eggs and do not ovulate normally .The disease is present at birth but does not cause symptoms until puberty. (Palacio et al, 2006)²

2. Materials & Method

The present prospective observational study carried out among female patients attending Gynecologic outpatient department of V.S.S. Medical College Burla, Sambalpur between October 2011 to september 2013. An informed written consent was obtained from all patients participating in the study. The protocol was approved by Obstetrics and Gynecology Department of V.S.S. Medical College, Burla, Sambalpur. Fifty women with PCOS diagnosed on the basis of clinical, hormonal and ultrasound parameters using the Rotterdam criteria. Two of the following features were applied to diagnose the PCOS:

- 1) Oligo-anovulation;
- 2) clinical or biochemical signs of hyperandrogenism;
- 3) polycystic ovaries .

Women with PCOS (n = 50) diagnosed by this criteria comprises the study group and women without PCOS ,

having regular cycles which were selected randomly comprised the control group (n = 50) taken all from the patient attending OPD of Obstetrics and Gynaecology dept, V.S.S. Medical College, Burla. Women in the control group were with other gynecological diseases, not on any hormonal medication, no known infertility and endocrinologic or dermatologic problems, and were apparently normal healthy women.

2.1 Inclusion Criteria

1. Women with oligomenorrhea defined as menstrual bleeding at intervals of greater than 35 days or abnormally infrequent menstrual bleeding characterized by three to six menstrual cycles per year.
2. No pre-existing medical illness.
3. Age 18-35 years

2.2 Exclusion Criteria

1. Pregnancy, lactation
2. Menarche less than 2 years ago
3. Known co-morbidity
4. Women on drugs known to cause abnormal uterine bleeding- hormonal contraceptives, drugs known to produce hirsutism/ galactorrhea (e.g. corticosteroids, androgens, cyclosporine, minoxidil, phenytoin, diazoxide, Cimetidine, Histamine-receptor blockade, Methyl dopa, etc). A detailed history was taken of each case and a thorough clinical examination was done.

3. Endocrinal Parameters

Serum Testosterone, thyroid stimulating hormone (TSH) and Prolactin levels were measured on day 2-3 of the menstrual cycle in all women. For amenorrhagic patients blood was drawn any day of the cycle. Hormonal assays were done

using RIA. The cut off values of the various hormones are as follows:

Assay	Normal Values
FSH	4.7 - 21.5 mIU/ml
LH	5 to 25 mIU/L
Prolactin	Upto 20ng/ml
Total testosterone	0.1- 0.9 ng/ml
Fasting insulin	3-25 IU/ml
TSH	0.5 mIU/ml - 6 mIU/ml)

3.1 Ultrasonography

An ultrasonographic examination (transabdominal) was performed in all women. PCO morphology was defined as presence of enlarged ovaries (>10ml in volume) with multiple (W12) peripheral sub-centrimetric follicles as per the Rotterdam consensus.

4. Observation

Table 1: Comparison of Hormonal Profile Between the Study and Control Groups

Hormonal Profile	PCOS CAES (n=50)	Control (n=50)	P value
	(mean \pm SD)	(mean \pm SD)	
LH (miu/ml)	8.43 \pm 2.781	6.03 \pm 2.91	< 0.0001(S)
FSH (miu/ml)	3.91 \pm 1.278	3.15 \pm 1.6	<0.0101(S)
LH/FSH ratio	2.18 /1	0.9/1	-
TSH μ iu/ml	3.03 \pm 2.541	2.98 \pm 33	0.9915(NS)
Prolactin (ng/ml)	21.37 \pm 26.079	12.6 \pm 7.4	0.0243(S)
Testosterone (ng/dl)	0.87 \pm 0.426	0.69 \pm 0.21	0.0086(S)

The mean serum LH in PCOS cases is 8.43 \pm 2.781mIU/ml compared to 6.03 \pm 2.91mIU/ml in control, which is statistically significant. The mean serum FSH in PCOS cases is 3.91 \pm 1.278mIU/ml compared to 3.15 \pm 1.6mIU/ml in control which is statistically significant. The mean serum TSH in PCOS cases is 3.03 \pm 2.541 μ IU/ml and this's not statistically significant with their control counterparts. The mean serum prolactin in PCOS cases is 21.37 \pm 26.079ng/ml compared to 12.6 \pm 7.4ng/ml with their control counterparts which is statistically significant. The mean serum testosterone in PCOS cases is 0.87 \pm 0.426ng/dl as compared to 0.69 \pm 0.21ng/dl in control group and their difference is statistically significant. The ratio of LH/FSH is 2.18 in PCOS cases compared to only 0.9 in control.

Table 2: Distribution of Cases According to Ovarian Volume by Ultrasonography

Ovarian Volume	PCOS Groups (n=50)		Control (n=50)		P Value
	n	%	n	%	
Ovarian volume >10	34	68	4	8	<0.0001(S)
Ovarian volume \leq 10	16	32	46	92	

P<0.0001(S)

- 68 % (n=34) of PCOS cases have enlarged ovaries measuring more than 10 ml, compared to only 8% in control and their difference is statistically significant.

Table 3: Distribution of Cyst in Ovary by Ultrasound

Significant cyst in ovary	PCOS Group(n=50)		Control Group (n=50)		P Value
	n	% age	n	% age	
Cyst in ovary \geq 12	30	60	3	6	< 0.0001(S)
Cyst in ovary < 12	20	40	47	94	

60% (n=30) of the PCOS group have more than 12 cyst of significant size as compared to only 6% in study group, and their difference is statistically significant.

5. Discussion

Polycystic ovary syndrome (PCOS) is a complex and heterogeneous disorder, affecting mostly women in reproductive age group. It is characterized by chronic anovulation, hyperandrogenemia, altered LH: FSH ratio (>2/3:1) and polycystic ovaries. Excess androgen levels lead to menstrual disturbances, development of ovarian cysts, hirsutism and other related disorders.

4.1 Serum Luteinising Hormone (LH)

From table no. 13, it is seen that the mean Luteinising hormone (LH) level in PCOS cases is 8.43 \pm 2.781miu/ml, and 6.03 \pm 2.91miu/ml in control and their difference is statistically not significant. **Ventiroli S et al⁴** observed high mean LH values in PCOS patients 27.9 \pm 5.9 IU/l at day 5-6 of menses which is significantly higher than the values found in our study.

4.2 Serum Follicular Stimulating Hormone (FSH)

From table no. 13, it is observed that the mean Follicular stimulating hormone (FSH) level is 3.91 \pm 1.278miu/ml compared to 3.15 \pm 1.6miu/ml in control, which is statistically not significant. The mean FSH level is low as compared to normal values given for any day of menstruation in accordance to **Chang et al (1983)⁵**

The gonadotropin releasing hormone (GnRH) pulse frequency designates the preferential production of LH via high frequency pulses versus FSH via low frequency pulses in normal adult women. The pulse frequency is regulated by progesterone in presence of estradiol such that increased progesterone production by corpus luteum slows LH pulse frequency to favor FSH production, which aids in follicular development for the next menstrual cycle. Women with PCOS have abnormally rapid LH pulses with reduced response to progesterone feedback, contributing to elevations in LH:FSH ratios. **Pastor et al. (1998)⁶**

4.3 LH/FSH Ratio

From table no 13, it is observed that the mean LH/FSH ratio is 2.18 : 1 in PCOS group which is highly significant, compared to 0.9:1 in control group, which is similar to the study done by **Chang et al, (1983)⁵** who reported similar ratio of LH to FSH in PCOS patients. The table & figure 13 also explain that the level of LH is more than two times of FSH level.

4.4 Serum Thyroid Stimulation Hormone (TSH)

From table no.13, it is observed that the mean Thyroid stimulating hormone (TSH) is 3.03 ± 2.541 mcg/dl in PCOS cases compared to 2.98 mcg/dl in control cases, which is statistically not significant. This may be due to the fact that patients with known thyroid abnormality were being excluded from our selection criteria. Women with PCOS have a high prevalence of increased thyroid-stimulating hormone (TSH) levels as evidenced by a study conducted by **Dahiya et al (2012)**⁷.

4.5 Serum Prolactin (PRL)

The mean serum Prolactin level is 21.37 ± 26.079 μ iu/ml in PCOS group as compared to 12.6 ± 7.4 μ iu/ml in control cases, showing a highly significant high TSH level in PCOS. Hyperprolactinemia was however seen in 10 % cases of study group.

4.6 Serum Testosterone

The mean serum testosterone level in study group is 0.87 ± 0.426 ng/dl compared to 0.69 ± 0.21 ng/dl in control group, and their difference is highly significant statistically in PCOS group, indicating biochemical signs of hyperandrogenism. The mean serum testosterone showed highly significant difference between PCOS patients and the control group, this study agreed with other studies (**Polson et al, 1988**)⁸ & (**Miriam et al, 2002**)⁹ that proved 55-65% of patients with PCOS had abnormal high testosterone values.

4.7 Ultrasonography

From table no.14 it is observed that, increased ovarian volume according to PCOS criteria ($>10 \text{ cm}^3$) was identified in 68 % (n=34) PCOS cases compared to only 8 % (n=4) in control which is highly significant statistically and is also close to the study done by **Hannet et al. (1984)**¹⁰ who studied the ultrasonological appearance of 28 patients with PCOS finding that 71% of the cases had bilaterally significantly enlarged ovaries ($>10 \text{ mm}^3$). The presence of 12 or more follicles between 2 and 9 mm diameter was seen in 60% (n=30) PCOS cases as compared to only 6% in control cases which is statistically significant.

6. Conclusion

Polycystic ovary syndrome remains a highly controversial topic because of its undetermined and potentially variable etiology and an undetermined phenotypic spectrum. In clinical and research practice, a conservative and broadly based definition of PCOS is warranted.

Thorough evaluation of these cases including clinical examination, laboratory findings as well as ovarian imaging is crucial in the evaluation of patients with suspected PCOS. The study justifies the elaborate evaluation of hormonal parameters and ultrasonography in polycystic ovarian syndrome (PCOS) patients. Hence, we emphasize that women with PCOS should no longer be regarded as merely having reproductive or cosmetic problems, but as having a

predisposition to a metabolic disorder that potentially puts them at high risk for developing diabetes and heart disease.

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